

THE SARCOFAGINAE OF AUSTRALIA AND NEW ZEALAND.

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(Twenty Text-figures.)

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With this paper a scheme is completed, whereby the Australian Sarcophaginae are classified on the characters of the terminalia. This taxonomic conception was initiated by some early authors, and, according to Professor W. S. Patton, the first to propose such a scheme was R. R. Parker (1914). Actually some groups were made on similarity of terminalia prior to his papers, and the idea grew naturally from an unspecified early date and was not the outcome of any particular paper. The first serious attempt to collect data for the purpose, using Australian species, was that of Hardy in 1927, but Johnston and Hardy had already seen some of these group values.

Rohdendorf (1937) was the first author to complete the system for any one large region and he has given a good account of the Palaearctic fauna in this light. Other authors are Drs. D. C. Hall in North and Central America, H. Sousa Lopes in South America, Chi Ho in China, H. H. Salem in Egypt, and W. S. Patton and C. J. Wainwright in England. There may be more authors, but their works are not available to me, and those mentioned have already covered ground sufficient to make it certain that the indigenous Australian fauna has its affinities almost entirely with the Palaearctic fauna.

Treatment of terminalia.—Owing to the aedeagus being partly impregnated with brown and partly hyaline and even membranous, it is advisable to study the terminalia *in situ* with reflected light under high magnifications of the microscope. For this purpose the parts are displayed by the normal method of spreading them. Very frequently authors advocate treatment in caustic potash, and it is mainly this treatment that is responsible for such wide discrepancies as are seen in drawings published. Parts are frequently broken down by the action of the caustic and even entirely lost to view. This defect was avoided by Hardy (1927), who cleared in turps-phenol, which removed all fatty matter without distorting the protruding parts that may be hyaline and tender. When so treated and mounted in Canada balsam, the structure and shape can be examined effectively under both transmitted and reflected light. The highly-translucent areas that may be projecting are readily traced by the edges that show quite clearly.

Structure of the aedeagus.—Johnston and Hardy proposed some terms for the aedeagus, terms that are now found to be applicable in their entirety only to the *Parasarcophaga*, a subgenus that forms a large part of the Australian and of the Palaearctic faunas. Some of these terms also apply to other sections, and all are needing better explanations.

The aedeagus has two articulating primary segments. The basal segment has a pair of struts usually quite inconspicuous, that are the homologue of the struts on Calliphorinae where they form a conspicuous feature. The second segment, which becomes the dominant part, varies from a simple, rather small structure, to a large and complicated one. In the latter case there is an anterior part, simple or complicated, called the anterior appendage, and also a posterior part called the sheath. A depressed line at the rear of the sheath divides this into two, the apical part being the apical process. Usually the sheath, in transverse section, just below the depression, is seen to be horse-shoe shaped, the two ends of the shoe being the position of the lobes. The lobes and the apical process are joined by an edge or arm of the horse-shoe on which

may lie another process. This is the inner process which seldom occurs on *Parasarcophaga* where it takes an inward direction and then turns to point ventrally. Elsewhere the inner process takes other forms, and on *Chrysosarcophaga* it is nearly always absent.

Apparently on *Parasarcophaga* the apical process becomes divided along the median line and thereby sets up a pair of lateral processes that are usually slender from base to apex and widely separated one from the other. Sometimes the lateral processes are very broad at the base and even may have a small process lying between them, usually, and perhaps always, simple. It is thus seen that the lateral processes are only a specialized form of the apical process which, in other subgenera, takes on different forms.

In *Chrysosarcophaga* the apical process may be simple, bifid or trifid, and it is frequently quite complicated with subsidiary projections and surface depressions. In *Pierretia*, where the lobe is absent, the apical process is perhaps primitively trifid, but on the Australian species the outer prongs have disappeared, leaving the central one, long, narrow and simple; also here the inner process is compounded of a long, ventrally-directed part and a laterally-directed flange.

In Johnston and Hardy's figures, these terms are not applied consistently with these improved explanations, and several of their figures are needing amendment in the lettering.

These general features discussed above apply to nearly the whole of the Palaearctic fauna, but numerous forms in the Americas, and species related to them in the Pacific and Australian regions, do not conform. It seems possible that the first grouping of the terminalia may be made on the presence and absence of the filaments in these cases. These filaments arise from inside the sheath and are acutely reflexed at their base, but are directed ventrally, often extending well beyond the apex of the sheath. At times they are concealed, as on *S. zeta*, and their presence can be found by dissection. Many forms in the Americas seem to lack these filaments entirely and the same applies to the rare Queensland *S. spinifera*, *S. varia* introduced into New Zealand, and the genus *Blaesoxipha*; and also they are discussed under the *ruficornis*-group below. The character may have generic significance.

Divisions of the Sarcophaginae.—Rohdendorf has given an interpretation of some early proposed Palaearctic genera with which the Australian fauna is involved. Although there may be no assurance that these early generic names will remain in the generic status given by Rohdendorf, there is assurance that the grouping of the species under the names is usually satisfactory. Rohdendorf accepts 26 genera under Sarcophagini, but this is a liberal allowance not acceptable in the present paper where 22 of them are amalgamated into six groups as follows:

1. *Blaesoxipha* Loew., includes Rohdendorf's genera numbered 1-5.—Aedeagus with second segment very small and without pronounced features.
2. *Pierretia* Desvoidy, includes genera 23 and 24.—Apparently a true lobe is never or rarely formed, but an inner process takes varied forms.
3. *Bellieria* Desvoidy, includes genera 6 to 10.—Similar, and probably belongs to the prior group.
4. *Sarcophaga* Meigen, in literature is a complex but should be restricted to genus 18. Typically this section has neither lobe nor inner process and the apical process conforms to the one general type.
5. *Parasarcophaga* J. & T., includes genera 11 to 16. The lateral process developed and also the lobe.
6. *Chrysosarcophaga* Townsend, includes genus 17.—Apical process simple, bifid or trifid and frequently with additional processes. Lobe almost invariably developed.
7. *Oxysarcodexia* Townsend, is temporarily adopted to cover the New Zealand species. The aedeagus is asymmetrical.

With these seven names, three genera and four subgenera may be formed without extending the classification beyond conservative ideas that are now current, nor has it been necessary to alter the basic principles which Rohdendorf used. Future develop-

ments will come when the faunas of other zoological regions are understood and co-ordinated within the same scheme.

Breeding Records.

The records of Sarcophaginae that have been bred in Australia are scattered and, omitting the *Blaesoxipha* which invariably are parasitic on grasshoppers, the following table forms a summary of the data, so far gathered.

Some in this list have been recorded as being parasites, that being an error, and although several species are said to have been reared from sheep's wool, only two have been adequately identified. The introduced *S. securifera* was reared, I believe, on two occasions in Sydney, both in decaying vegetation, which is its well-known food medium.

Table of Breeding Records.

	Wool.	Vertebrates.	Invertebrates.	Vegetation.	Excrement.
<i>Pierretia australis</i>	—	Meat	Grasshoppers	—	—
<i>Sarcophaga zeta</i>	—	"	—	—	—
<i>beta</i>	—	"	—	—	—
<i>tryoni</i>	—	"	—	—	—
<i>impatiens</i>	—	"	—	—	—
<i>froggatti</i>	Wool	"	—	—	—
<i>omikron</i>	"	"	—	Potatoes	—
<i>triplex</i>	—	—	Cossid pupa	—	—
<i>peregrina</i>	—	Meat	—	—	Human
<i>kappa</i>	—	"	—	—	—
<i>depressa</i>	—	"	Grasshoppers	—	—
<i>misera</i>	—	"	—	—	Horse
<i>kohla</i>	—	—	Mollusca	—	—
<i>eta</i>	—	Meat, Fish	—	—	—
<i>aurifrons</i>	—	Meat	—	—	—
<i>securifera</i>	—	—	—	General	—
<i>varia</i>	—	—	—	—	Cow

Subfamily SARCOPHAGINAE.

Hardy, *Proc. Roy. Soc. Qd.*, xlv, 1934, 31 (in key).

All references quoted in this paper are additional to those quoted by Johnston and Hardy, 1923, in "A revision of the Australian Diptera belonging to genus *Sarcophaga*" and thus form a supplement needed to complete a revision of the subfamily, bringing the whole into alignment with the modern methods of classification. Those characters that allow the species to be grouped into generic conceptions on the terminalia are given above, those serviceable for general use are incorporated in the key below.

Key to Genera and Subgenera of Sarcophaginae.

1. Parasitic species having a small slender aedeagus and the posterior clasper devoid of bristles. Forceps with a scattered minute bristly vestiture and in profile seen to be deeply indented near the base. With three pairs of posterior dorso-central bristles which are uniformly distributed Genus *Blaesoxipha*
Non-parasitic forms with the aedeagus enlarged and frequently with bristles on the posterior clasper. Forceps with a hairy vestiture and without marked indentation basally, and such bristles and bristly vestiture that may be found are much longer 2
2. Three uniformly distributed postsutural dorso-central bristles, together with the normal symmetrical aedeagus and simple claspers Genus *Pierretia*
Normally four or five postsutural dorso-central bristles, but if only three occur, then these are arranged on the posterior half of the line, or else if they be uniformly distributed then the aedeagus is asymmetrical and the apex of the anterior clasper is strongly bent laterally Genus *Sarcophaga* 3
3. Only three postsutural dorso-central bristles uniformly distributed (New Zealand) Subgenus *Oxysarcodexia*
Four or five postsutural dorso-central bristles, but sometimes only three irregularly spaced so as to leave a wide space between them and the transverse suture 4

4. Propleura densely hairy to moderately so, or if bare then the antennae are red Subgenus *Chrysosarcophaga*
 Propleura bare, or at most a few black hairs may occur and are confined to the centre of
 that area. Antennae black 5
5. Lobe and lateral process of aedeagus always well defined Subgenus *Parasarcophaga*
 Lobe and lateral process not developed Subgenus *Sarcophaga*

BLAESOXIPHA Loew.

Hardy, PROC. LINN. SOC. N.S.W., lxi, 1936, 95.

As far as can be judged from literature available, the early proposed generic names that fall to synonymy under this genus include *Servaisia* and *Listeria* Desvoidy, 1863, and *Sfaerogaster* Lioy, 1864. Rohdendorf proposed *Locustaevora*, which is very close to *Locustivora* J. & T. and both belong to the present genus.

BLAESOXIPHA PACHYTILI Skuse. Fig. 1.

Hardy, PROC. LINN. SOC. N.S.W., lxi, 1936, 96 (which see for further references).
Locustivora pachytyli Noble, Agric. Gaz. N.S.W., xlviii, 1936, 383; figs. 1 and 2.

Hab.—New South Wales and Queensland.

BLAESOXIPHA GEMINA, n. sp. Fig. 2.

Blaesoxipha sp. Hardy, PROC. LINN. SOC. N.S.W., lxi, 1936, 96 (in key).

Already characters have been given for this species which is very close to the former one. The difference in terminalia lies in the distinctive second segment of the aedeagus; in *B. pachytyli* there is a rather rectangular flange on each side and a small apex juts out beyond this, whilst in the present species there is no marked flange, the sheath showing simple outlines. One of the drawings shows that the two sides are curved inwards slightly where a slight bulge is seen, and both of the figures show by dotted line the limits of the area impregnated with brown. Outside this dotted line the sheath is hyaline and may be overlooked if care be not taken to follow the true edge. Both figures are taken from the holotype which has its terminalia mounted in Canada balsam.

Hab.—Queensland. Six males from the Greenbank Road, off Beaudesert Road, south of Brisbane.

PIERRETIA Desvoidy.

Pierretia Desvoidy, *Hist. nat. Dipt.*, ii, 1863, 421; Rohdendorf, *Zool. Inst. Acad. Sci. URSS.*, (12) xix, 1937, 303, 470. *Helicobia* Johnston & Tiegs, *Proc. Roy. Soc. Qd.*, xxxiii, 1921, 50; Johnston & Hardy, *Rec. Aust. Mus.*, xiv, 1923, 69; Hardy, *Aust. Zool.*, vii, 1932, 275; PROC. LINN. SOC. N.S.W., lxi, 1936, 90; Tonnoir, *ibid.*, lxiii, 1938, 129–30—*nec* Coquillett 1895.

It is assumed here that *Pierretia* may contain two subgenera, typically having the first basal vein hairy, whilst *Bellieria*, the second subgenus, has it bare. This division ultimately, will prove unsatisfactory, as certain forms placed in the latter seem to belong to the former on terminal characters. This division, however, is temporarily convenient, as it allows certain adjustments to be made.

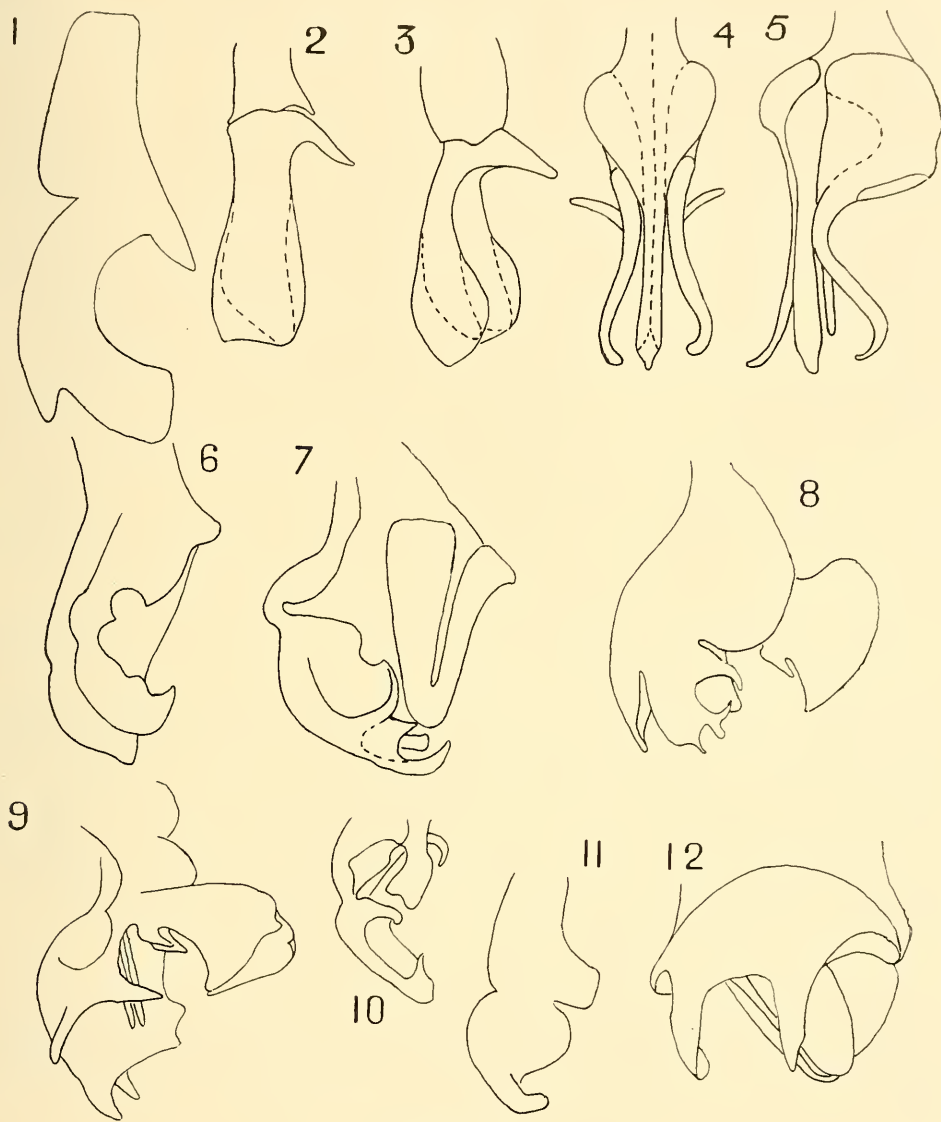
Four names, *Bercaea*, *Erichsoni* (preoccupied), *Hartigia* and *Mulsentia*, all proposed by Desvoidy in 1863, fall to *Pierretia*. Tonnoir stated that I misunderstood the first of these, quoting my 1936 paper, but actually that name has not appeared in any of my papers prior to the present one. Two further names, *Scalligeria* and *Calypttrata*, also proposed by Desvoidy in 1863, fall to *Bellieria*.

As far as I know, *Bellieria* does not occur in Australia, but is plentiful in the Palaearctic region. There are, however, two female specimens, collected in traps by the late Mary Fuller, which I had suggested might be *Sarcophila*, but at that time I was not familiar with *Blaesoxipha* and they need a re-examination. If not the latter genus, they probably come here under the present subgenus.

PIERRETIA AUSTRALIS J. & T. Fig. 3.

Helicobia australis Johnston & Tiegs, *Proc. Roy. Soc. Qd.*, xxxiii, 1921, 50; fig. 24; *Rec. Aust. Mus.*, xiii, 1922, 176; Johnston & Hardy, *Rec. Aust. Mus.*, xiv, 1923, 69; fig. 3;

Curran, *Amer. Mus. Nov.*, 375, 1929, 12; Noble, *Agric. Gaz. N.S.W.*, xlvii, 1936, 383; Tonnoir, *Proc. Linn. Soc. N.S.W.*, xliii, 1938, 129-132; figs. 1 and 2; Fuller, *ibid.*, 133-8, figs. 1-5 (biology); Hardy, *Proc. Roy. Soc. Qd.*, li, 1940, 145; Lopes, *Rev. Ent. Brazil*, x,



Figs. 1-12.

Fig. 1.—*Blaesoxipha pachytyli* Skuse, lateral view of the aedeagus. Figs. 2 and 3.—*Blaesoxipha gemina*, n. sp., lateral view of the aedeagus, the latter seen a little anteriorly so as to show the edge of the hyaline border. The dotted line marks the limit of the brown impregnation, outside of which it is hyaline. Figs. 4 and 5.—*Pierretia australis* J. & T., showing respectively the posterior view with its hyaline tip, and nearly laterally to show the position of one filament, and its relative length. Figs. 6 and 7.—*Sarcophaga zeta* J. & T., seen laterally, and more anteriorly to show the filament and the tridentate nature of the apex, both of which can be exposed by slight manipulation of the parts. Figs. 8 and 9.—*Sarcophaga tryoni* J. & T., showing more or less laterally the cleft at the apex of the sheath, and the sheath distorted so as to expose the filaments. Fig. 10.—*Sarcophaga impatiens* Walker, showing the area of lateral indentation of the apical process, the lobe and the hook-shaped process that shows only on dissection. Figs. 11 and 12.—*Sarcophaga froggatti* Taylor, showing respectively the lateral view of the aedeagus as normally seen, and the bifid apex of the sheath as seen more posteriorly.

1939, 517. *Sarcophaga australis* Malloch, *Insects of Samoa*, vi, Dipt., fasc. 9, 1929, 365 (preoccupied by Aldrich, 1916).

For the generic position of this fly, Tonnoir was following Townsend's classification upon which Curran had placed two allied species in Africa as being *Helicobia*. Rohdendorf had already removed those African forms from the genus the genotype of which was unknown to Tonnoir. Moreover *Helicobiopsis* Townsend, which Tonnoir treated as a distinct genus, has since been found by Lopes to be congeneric with *Helicobia*.

Tonnoir claimed that there were four paired parts in the aedeagus, and his figure shows them to be (1) the laterally-directed flange that arises from the sheath, but in that figure is shown as arising from the filaments; (2) the curved process which together with the former becomes the inner process; (3) the filaments; and (4) the apical process which is claimed to be split, but actually forms one process only. Johnston and Hardy's figure gives these same processes correctly, and the split apex shown by Tonnoir is undoubtedly caused by the treatment he gave in caustic potash. The figures here given contain a more detailed outline drawn from the aedeagus mounted in Canada balsam.

Tonnoir does not mention the ultimate treatment given by him to terminalia on the holotype; these he cleared in caustic potash and then gummed on a card attached to the pin of the fly, and he did not mount them in Canada balsam which was his normal method.

The second bristle of the posterior clasper sometimes occurs, but this is variable within the genus and is not a generic character.

Hab.—Queensland, New South Wales, Lord Howe Island and Samoa. Some females in the collection of Mr. R. K. Norris appear to be this species and are from Western Australia.

SARCOPHAGA Meigen.

Johnston & Hardy, *Rec. Aust. Mus.*, xiv, 1923, 63; *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 94.

In literature this genus remains a complex, but numerous subdivisions have been proposed, many graded into genera and subgenera. Four named subgenera cover the species in Australia and New Zealand. These subgenera mostly are Palaearctic, but there also seems to be a slight contact with the fauna of the Americas where it is possible that the presence and absence of the filaments might aid considerably in dividing this genus into its natural groups. In the Australian region this clue seems to act rather well, as the species normally have the filaments which are missing in *S. varia* and *S. spinifera* (which seem to have exotic relations); and also they are not developed in some of the *Parasarcophaga* as discussed under the *ruficornis*-group.

Subgenus OXYSARCODEXIA Townsend.

Townsend, *Proc. Biol. Soc. Wash.*, xxx, 1917, 191 (in key).

This section is recognizable by the asymmetrical aedeagus, but Hall has thrown doubt upon the advisability of accepting the unit. For the species here concerned, Enderlein has proposed the name *Hybopygia*, but actually the relationships are not clear.

SARCOPHAGA VARIA Walker.

S. varia Walker, *Trans. Linn. Soc. Lond.*, xvii, 1837, 353; Aldrich, *Proc. U.S. Nat. Mus.*, lxxviii, 1930, 14; fig. 1; Hall, *Dipt. Pat. and S. Chile*, vii, 1937, 365. *S. milleri* Johnston & Tiegs, *Rec. Aust. Mus.*, xiii, 1922, 185; fig. 1; Hardy, *Proc. Linn. Soc. N.S.W.*, lii, 1927, 455; fig. 8; Miller, *Cawthron Inst. Monog.*, ii, 1939, 23; Pl. 1, fig. 6. *S. impatiens* of early authors in New Zealand literature—*nec* Walker.

Hab.—New Zealand. This South American species was evidently introduced into New Zealand in early days, perhaps with cattle or whaling vessels. Miller states that its maggots are commonly found in cow droppings, and he thinks it may also breed in vegetation. He further states that it has the reputation of "biting", due to the sensation given by the bristly tarsi and abnormally large claws.

Subgenus CHRYSOSARCOPHAGA Townsend.

Chrysosarcophaga Townsend, *J. N.Y. Ent. Soc.*, xl, 1932, 441; Hardy, *Proc. Linn. Soc. N.S.W.*, lxi, 1936, 94, 97; Rohdendorf, *Inst. Zool. Acad. Sci. URSS.*, (12) xix, 1937, 277, 461. *Tricholioproctia* Baranoff, *Bull. Ent. Res.*, xxix, 1938, 414.

Finding that the typical form of *Chrysosarcophaga* is without hairs on the propleura, Baranoff proposed a new generic name for those that have this character. It seems, however, that the hairs are normally dense and long, but they vary in size and number to comparatively few short bristly ones, and even may be absent. As far as is known, the subgenus is limited to the Oriental, Pacific and Australian regions. Phylogenetically it appears to be older than *Parasarcophaga*, but both are closely akin to the subgenus *Sarcophaga*.

Key to Species of Chrysosarcophaga.

Except where otherwise stated, (a) the antennae are black, (b) dark bristly hairs do not occur behind the normal row of postoculars, (c) the propleura is hairy, (d) prescutellar acrostichals are present and (e) the filaments are conspicuous.

1. The sheath of the aedeagus is not cleft, at most tridentate. Anterior clasper bifid and a chitinous knob is placed in the membrane anteriorly to it. Posterior clasper with a bristle placed beyond the middle of the anterior edge 2
Sheath conspicuously cleft at apex 3
2. Sheath simple *alpha*
Sheath tridentate at apex and the short filaments are difficult to detect owing to the compactness of the parts *zeta*
3. Apex of sheath bifid 4
Apex of sheath trifid 9
4. Anterior clasper with a large flange that reaches to near apex. Bristle on posterior clasper in median position 5
Anterior clasper with the flange limited to the basal half or absent 6
5. Prescutellar acrostichals present *impatiens*
Prescutellar acrostichals absent. Filaments short and not easily detected *tryoni*
6. Posterior clasper with the bristle placed basally 7
Posterior clasper with the bristle placed in the median position. Sheath flattened out showing a clear-cut outline. Anterior clasper with a basal flange *hardyi*
Posterior clasper with the bristle placed subapically 8
7. Prescutellar acrostichals present *littoralis*
Prescutellar acrostichals absent. Cleft of sheath forming a wide gap, about as wide as long *froggatti*
8. Sheath with a pair of knobs on the rear near the base of the apical process *omikron*
Sheath simple, without such knobs. Antennae red *bancrofti*
9. Anterior clasper bifid. Almost invariably with an anterior knob in membrane 10
Anterior clasper with a flange or simple 12
10. Second abdominal segment with a pair of median discal bristles *hovenensis*
Without such bristles 11
11. Filaments protruding. With a knob placed in membrane anteriorly to claspers *beta*
Filaments concealed. Without such knob *furcata*
12. Anterior clasper with the bristle placed in the median position 13
Anterior clasper with bristle placed in the subapical position *epsilon*
13. Prescutellar acrostichals present. With the basal flange on anterior clasper 14
Prescutellar acrostichals absent or at most very weak. Anterior clasper simple. Filaments concealed *fergusonina*
14. Sheath of aedeagus highly complex. Filaments concealed *alcicornis*
Sheath of aedeagus simple, the apex having no marked processes other than the three apical prongs massed together *triplex*

In the above key advantage has been taken of the sheath which is found in three marked types, one without cleft, one two-pronged and one three-pronged, which proves useful for assessing relationships. The females do not offer many characters for distinguishing them, as seen in the following key:

Key to Species based on Females.

1. Propleura bare, or practically so, antennae black Other subgenera
Propleura bare, antennae red *bancrofti*
Propleura densely hairy 2
2. Two rows of black bristly hairs behind postoculars *epsilon*
Without black bristly hairs behind postoculars 3
3. With a pair of discal bristles on second abdominal segment *hovenensis*
Without such bristles 4

- | | |
|---|--|
| 4. Prescutellar acrostichals present | 5 |
| Prescutellar acrostichals absent | <i>tryoni</i> , <i>froggatti</i> |
| 5. Frons abnormally wide, being twice the width of an eye | <i>littoralis</i> |
| Frons normal | 6 |
| 6. Frons deeply golden | <i>alpha</i> , <i>zeta</i> , <i>beta</i> , <i>impatiens</i> , <i>alcicornis</i> , <i>omikron</i> |
| Frons yellow, i.e., paler | <i>hardyi</i> , <i>fergusonina</i> , <i>furcata</i> , <i>triplex</i> |

Some further aid in recognizing females may be gained by noting distribution. *S. hardyi* is limited to Tasmania and the environments of Kosciusko and probably other southern mountains. *S. fergusonina* occurs in the sheep country of Queensland and New South Wales, where also *S. omikron* mainly occurs. *S. impatiens*, the coastal species of New South Wales, reaches southern Queensland where the distribution overlaps the common Queensland *S. tryoni*.

SARCOPHAGA ANTILOPE-GROUP.

Hardy, Proc. LINN. Soc. N.S.W., lii, 1927, 448; *ibid.*, lxi, 1936, 94; *Aust. Zool.*, viii, 1934, 50.

Readily distinguished from all others by the forked anterior clasper.

SARCOPHAGA ALPHA J. & T.

? *Sarcophaga antilope* Bottcher, *Ann. Mus. Nat. Hung.*, xi, 1913, 380; fig. 3; Ho, *Ann. Trop. Med. Parasit.*, xxxii, 1938, 116; figs. 1 and 2. *Sarcophaga alpha* Johnston and Hardy, Proc. LINN. Soc. N.S.W., xlviii, 1923, 105; fig. 6.

In the view of Johnston and Hardy, this species can hardly differ from *S. antilope* Bott. from Formosa. Ho has given another drawing under the latter name that augments this idea, but he confused this simple rendering by claiming that *S. antilopoides* Hardy, from Java, is conspecific. Bottcher clearly states that the aedeagus is like that of *S. carnaria*, so, obviously, it cannot be trifid, and this distinguishes it from *antilopoides*.

In addition to these characters, the hairs on the propleura are distinct on the species. Normally these are light in colour, very long and dense, but on *S. alpha* (presumably also on *antilope*) they are black, much shorter and much less dense. On *S. antilopoides* they are still more reduced, being quite bristly, shorter and scattered.

Hab.—Known from two Queensland specimens originally recorded, but if identical with *antilope*, then the distribution would cover Queensland, New Guinea, Java and Formosa. The species *antilopoides*, described from Java, probably occurs also in Manus, an island of the Mandated Territory of New Guinea, as three female specimens appear to belong to it, and were captured by Mr. N. E. H. Caldwell.

SARCOPHAGA ZETA J. & T. Figs. 6 and 7.

Johnston & Hardy, Proc. LINN. Soc. N.S.W., xlviii, 1923, 105; fig. 7.

A careful analysis of the aedeagus has been made by me on several occasions and there can be no doubt that its apex is tridentate, the central projection is somewhat hidden, the outer ones conspicuous. This forms an intermediate between the *alpha* type and the three-pronged type of the others belonging to the *antilope*-group. The aedeagus is very compact, the filaments hardly reaching the apex and are difficult to detect without dissection.

Hab.—Queensland. So far specimens have been caught only in Brisbane, where they are rather scarce.

SARCOPHAGA BETA J. & T.

Johnston & Hardy, Proc. LINN. Soc. N.S.W., xlviii, 1923, 107; fig. 8; *Rec. Aust. Mus.*, xvi, 1923, 66; fig. 1 (*f*).

Hab.—Queensland. At times fairly abundant and sometimes quite common in Brisbane.

SARCOPHAGA HOWENSIS J. & H.

Johnston & Hardy, *Rec. Aust. Mus.*, xiv, 1923, 65; fig. 1 (*a-e*).

Hab.—Lord Howe Island.

SARCOPHAGA FURCATA Hardy.

Hardy, *Aust. Zool.*, vii, 1932, 277; fig. 3; Proc. LINN. Soc. N.S.W., lxi, 1936, 91–2 (in keys).

Hab.—Queensland.

SARCOPHAGA IMPATIENS-GROUP.

Hardy, *Aust. Zool.*, viii, 1934, 50, 53; *Proc. Linn. Soc. N.S.W.*, lxi, 1936, 90, 94.

The limits of this group become questionable as *S. froggatti* Taylor would seem to be associated with others previously placed here. It is advantageous, therefore, to include nearly all species that have the bifid apex as being probably a homogeneous unit. The exception, *S. bancrofti*, is possibly a decadent type.

SARCOPHAGA TRYONI J. & T. Figs. 8 and 9.

Johnston & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 108; fig. 9; Hardy, *ibid.*, lii, 1927, 450.

In Johnston & Hardy's figure, the letters '*l.p.*' should be erased and the apex of the lobe marked there is the filament. Two drawings of the sheath given here show the cleft in the apical process which is complex, and also the position of the filaments which are short.

Hab.—Queensland, widely distributed along the coastal region. The record for the Northern Territory by G. F. Hill is needing confirmation. Its biology has been recorded by Hardy in 1927.

SARCOPHAGA IMPATIENS Walker. Fig. 10.

Johnston & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 109; fig. 10.

Already three authors have illustrated the aedeagus of this species, but have given inadequate figures in the light of an analysis of the parts. Laterally there is a large depressed area on each side of an otherwise simple cleft apical process. The lobe is well marked, arising well away from the base of the apical process, and the ridge between them is turned into an outwardly-directed flange that becomes in position an inner process. Arising from somewhere inside, there is an upturned hook that is not seen till dissected and is shown in the second figure adjacent to the lobe. The so-called lobe of Johnston and Hardy's figure is part of the apical process; the true lobe is not seen there owing to the curvature of the sheath. Parker's figure has a spiral formation that has no existence, lying in the depressed area, which Johnston and Tiegs' figure does not show at all.

Hab.—Queensland and New South Wales. The record from Tasmania refers to *S. hardyi*, not the present form.

SARCOPHAGA HARDYI J. & T.

Johnson & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 111; fig. 12; Hardy, *Aust. Zool.*, viii, 1934, 50.

The letters '*l.p.*' should be deleted from Johnston and Hardy's figure, which is otherwise quite accurate.

Hab.—Tasmania. New South Wales: Mt. Kosciusko. Also a seasonal fly in Canberra.

SARCOPHAGA FROGGATTI Taylor. Figs. 11 and 12.

Johnston & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 118; fig. 19; Hardy, *Aust. Zool.*, viii, 1934, 50.

The sheath is wrongly labelled in the figure by Johnston and Hardy. The apex has two widely separated processes and the lobe is very stunted, almost non-existent.

Hab.—New South Wales, and Queensland. The record from the Northern Territory by G. F. Hill is needing confirmation.

SARCOPHAGA LITTORALIS J. & T.

Johnston & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 126; fig. 27; Hardy, *Aust. Zool.*, viii, 1934, 50.

Normally the lobe is strongly inturned on this species.

Hab.—New South Wales and Queensland; sea-shore and estuaries.

SARCOPHAGA OMIKRON J. & T. Figs. 13 and 14.

Johnston & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 120; fig. 21; Hardy, *ibid.*, lxi, 1936, 95; *Proc. Roy. Soc. Qd.*, li, 1940, 144.

This is the only species on which the lobe has not been detected, but it may be strongly inturned. The ventral view of the aedeagus given by Johnston and Tiegs seems unsatisfactory, and the two views given here, showing the positions and shape of the sheath knobs and apical process, make the general shape clearer.

Hab.—Queensland, New South Wales, South Australia and Western Australia. It is chiefly an inland species but not uncommon at times in the coastal areas.

Miscellaneous Group.

The apical process on most of the following forms is trifid and the three first are certainly inter-related. It is probable that four forms will join up, by species with intermediate characters, with the *antelope*-group. The fifth species, *S. bancrofti*, could, at best, be grouped as a decadent type allied with *froggatti*, *littoralis* and *omikron*; it was placed by me under the "*ferguson*-group" before the two species concerned were found to be conspecific, and that group name now has no standing.

SARCOPHAGA ALCICORNIS Hardy.

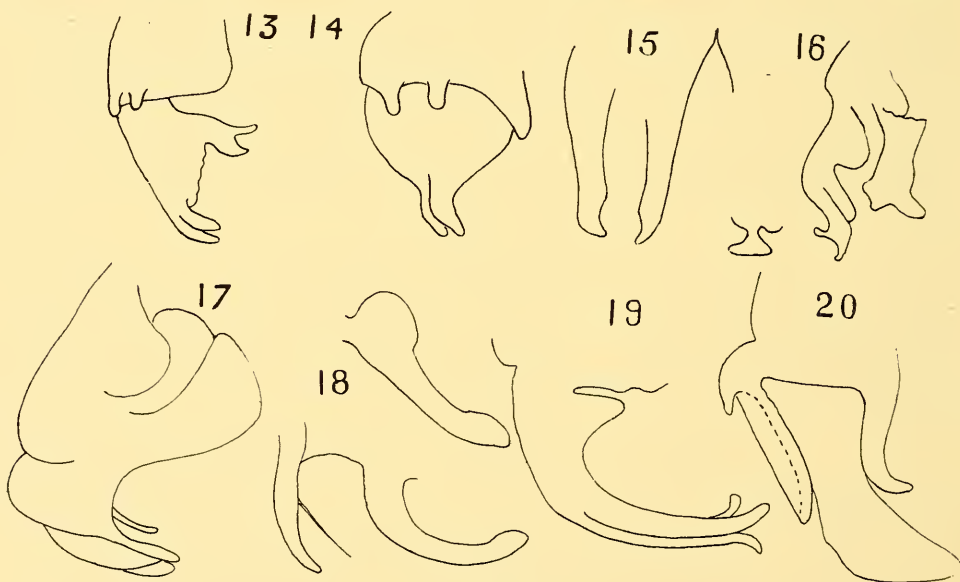
Hardy, *Aust. Zool.*, vii, 1932, 275; fig. 1; *ibid.*, viii, 1934, 50; Lopes, *Mem. Inst. Oswaldo Cruz*, xxxiii, 1938, 560; Pl. 2, figs. 8 and 9; Pl. 3, fig. 1.

Hab.—Queensland.

SARCOPHAGA FERGUSONINA Hardy. Figs. 15 and 16.

S. ferguson Hardy, *Proc. Linn. Soc. N.S.W.*, lxi, 1936, 95; *nec* Johnston and Tiegs. *S. fergusonina* Hardy, *Proc. Roy. Soc. Qd.*, li, 1940, 145.

Hab.—The inland border country of Queensland and New South Wales; although a sheep-country fly, this species, so far, has not been found associated with carrion.



Figs. 13-20.

Figs. 13 and 14.—*Sarcophaga omikron* J. & T., apical process with the pair of knobs at the base, seen from two rearward positions. Figs. 15 and 16.—*Sarcophaga fergusonina* Hardy, showing respectively the lateral and posterior views of the forceps, and the lateral view of two adjacent branches of the trifid apical process and the shape of the anterior appendage. The apex, seen from the rear, is also outlined. Figs. 17 and 18.—*Sarcophaga triplex*, n. sp., lateral view of the aedeagus and claspers respectively, also the dorsal aspect of the anterior clasper showing the basal flange. Fig. 19.—*Sarcophaga epsilon* J. & T., lateral view of the trifid apical process. Fig. 20.—*Sarcophaga kappa* J. & T., lateral view of the apical process and lobe, with the enlarged inner process between them. Each lateral process has a small projection at the base as shown, and brown impregnation occurs there and along the anterior border. Posteriorly to the dotted line the colour is whitish, which area apparently is a flange extending the length of the process and reaching the median line of the aedeagus.

SARCOPHAGA TRIPLEX, n. sp. Figs. 17 and 18.

The outer vertical bristles have not been detected, and no black bristly hairs occur behind the postoculars. Propleura densely hairy. Presutural and prescutellar acrostichal bristles present. Two or three intra-alars present. One row of discal lateral bristles on the first abdominal segment and in other respects the chaetotaxy is normal.

The aedeagus is remarkable in its apparent simplicity, the only outstanding character being the three-pronged apex to the sheath, but these prongs are so massed together that it is not easy to disassociate them one from the other. The anterior clasper has a basal flange and the posterior clasper has one bristle placed in the median position. The fly has the general appearance of the genus, with a strong trend towards the greyish rather than the golden tone.

Hab.—Queensland; three males in the Department of Agriculture were reared from a Cossid larva that was under observation in its natural habitat, the lemon-scented gum, *Eucalyptus citriodora*, west of Maryborough, by Mr. A. R. Brimblecombe. The holotype has been transferred to the Queensland Museum.

SARCOPHAGA EPSILON J. & T. Fig. 19.

Johnston & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 110; fig. 11; Hardy, *Aust. Zool.*, viii, 1934, 50.

Hab.—New South Wales and Queensland.

SARCOPHAGA BANCROFTI J. & T.

Johnston & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 122; fig. 23; Hardy, *ibid.*, lxi, 1936, 94; *Proc. Roy. Soc. Qd.*, li, 1940, 145. *S. fergusoni* Johnston & Hardy, *ibid.*, 1923, 124; fig. 24.—*nec* Hardy, 1936.

The antennae are said to be "ochre" and "brown" by Johnston and Tiegs, but on the holotype they are red with a trend towards orange, and this is the colour found on specimens collected by me.

Hab.—Queensland and New South Wales; chiefly inland.

Subgenus PARASARCOPHAGA J. & T.

Hardy, *Aust. Zool.*, viii, 1934, 50–1; *Proc. Linn. Soc. N.S.W.*, lxi, 1936, 90–2; Rohdendorf, *Inst. Zool. Acad. Sci. URSS.* (12) xix, 1937, 191 and 436.

The outstanding character of species so far gathered together under this subgenus, lies in the combination of a pair of lateral processes that arise from the apical process, one each side, and the remainder of the apical process, if present, is not cleft in any way. There is a marked tendency for the lobe to develop a considerable process. An inner process may be present but is rare, and apparently when present the filaments are absent; it takes the sinuous form at its base, being directed inwards and then ventrally.

The shape of the lateral processes is varied and may be broad at the base, tapering to the apex irregularly or regularly, but more frequently it is more or less parallel sided with or without a subsidiary process. When parallel sided the filaments are always present.

Key to Groups of the Parasarcophaga.

1. Lateral processes normally broad at base and widely separated one from the other. Inner process present. Filaments absent. Normally a few bristly hairs occur on the propleura *peregrina*-group
If the lateral processes be broad at the base, then either they are contiguously placed and the inner process is present, or else they are separated and neither inner process nor filaments are present. Normally, however, the lateral processes are parallel sided . . . 2
 2. Lateral process broad at the base *ruficornis*-group
Lateral process parallel sided and narrow; filaments present 3
 3. Anterior appendage all in one piece being cup-form mounted on a stem *albiceps*-group
Anterior appendage cleft into two or more parts from the base *misera*-group
- The *misera*-group is by far the largest, containing at least 70 per cent. of the world's forms, and half the Australian species belong there.

Key to Species of Parasarcophaga.

Unless otherwise stated, (a) no black bristly hairs occur behind the postocular row of bristles, (b) the genitalia are black, (c) there are two closely-associated bristles placed sub-apically on the posterior clasper, and (d) the lateral processes are widely separated.

1. Propleura normally with a few black bristly hairs. Inner process present, the lateral process is irregular in shape and broad at base, the lobe is enlarged *peregrina*
Propleura completely bare 2
2. Inner process present. The lateral processes are contiguous along the median line, pale except on the outer edge, which shows a border of brown. Lobe formed by a slender process. Three bristles are widely separated on the posterior clasper *kappa*
Without an inner process 3
3. Lateral process very broad at base and tapering to apex. One subapical bristle on posterior clasper *depressa*
Lateral process slender, approximately parallel sided 4
4. Genital segments red. Three bristles widely separated on posterior clasper *securifera*
Genital segments black, or dark brown 5
5. Anterior appendage all in one piece, cup-form on a slender stalk 6
Anterior appendage cleft from the base into two or more parts 7
6. Projections arising from the compact anterior appendage short *omega*
Projections arising from the anterior appendage spreading widely and reaching beyond the width of the sheath. The lateral processes are contiguous *orchidea*
7. With black bristly hairs behind postocular bristles 8
Without such black bristly hairs *misera*
8. With two rows of black bristly hairs behind postoculars 9
With only one such row. Lobe, filaments and anterior appendage excessively long *eta*
9. Anterior appendage with two pairs of foliaceous parts *kohla*
Anterior appendage with only one pair of foliaceous parts *aurifrons*

Key based upon Females.

1. Propleura normally with a few black bristly hairs. With a row of black bristly hairs behind postoculars *peregrina*
Propleura always bare 2
2. With black bristly hairs behind postoculars 3
Without black bristly hairs behind postoculars 5
3. Apex of abdomen red *securifera*
Apex of abdomen black 4
4. With one row of black bristly hairs behind postoculars *eta*
With two rows of black bristly hairs behind postoculars *aurifrons, kohla*
5. Presutural acrostichals absent *misera*
Presutural acrostichals present *kappa, depressa, omega, orchidea*

SARCOPHAGA PEREGRINA-group.

Hardy, Proc. LINN. SOC. N.S.W., lii, 1927, 453; *Bull. Ent. Res.*, xxiii, 1932, 45.
Boettcherisca Rohdendorf, *Inst. Zool. Acad. Sci. URSS.*, (12) xix, 1937, 271, 458.

The status of this group is open to widely different opinions, and Rohdendorf raised it to generic status chiefly on the propleural hairs, which, however, widely vary in number and may be reduced to one or two and even may be difficult to detect, if not actually absent.

Four species are recognized in the Oriental region. *S. septrionalis* Rohd. from Siberia, *S. hudsoni* Parker from India and Ceylon, *S. karnyi* Hardy from Java and *S. fuscicauda* Bott. from Formosa. The last of these has been found identical with *S. peregrina* Desv. from Australia (Johnston and Tiegs' identification), also its distribution covers China, Japan and various islands of the Pacific. J. L. Illingworth (*Proc. Hawaii Ent. Soc.*, vii, 1925, 262-5) has suggested that *S. fuscicauda* is being distributed throughout the Orient by shipping, but in 1932 I was able to show that at least three species were confused in literature under the name. This does not alter Illingworth's main idea, and, if he be correct, then the so-called *peregrina* may have been introduced into Australia as claimed, and perhaps it is indigenous to China; this would fit in with the general distribution of the group.

Ho has recorded *fuscicauda* from Java and he suggests that *karnyi* is conspecific. Probably Ho misidentified the three specimens before him, but if not, then *fuscicauda* has been introduced to the island. The chief difference between the two lies in the shape of the inner process.

The nearest relationship for this group seems to be found in *Stackelbergeola* and two or three forms placed under *Parasarcophaga*, subgenus *Liosarcophaga*, in Rohdendorf's classification, and these seem to be limited to the Palaearctic region. Together, all these may form the basis of a natural group, but there is only one species

in Australia that is concerned. If this species has been introduced, then it seems certain that the name *peregrina* does not apply to it and *fuscicauda* should be substituted.

SARCOPHAGA PEREGRINA Desvoidy.

Johnston & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 121; fig. 22; Hardy, *ibid.*, lii, 1927, 453; *Bull. Ent. Res.*, xxiii, 1932, 45; Curran, *Amer. Mus. Nov.*, 375, 1929, 11; Rohdendorf, *Inst. Zool. Acad. Sci. URSS.*, (12) xix, 1937, 271; figs. 374-5 (*Boettcherisca*); Lopes, *Mem. Inst. Oswaldo Cruz*, xxxiii, 1938, 561; Pl. 3, figs. 2-5. *fuscicauda* Botcher, *Ent. Mitt.*, i, 1912, 168.

Hab.—Queensland, New South Wales and South Australia; possibly introduced.

SARCOPHAGA RUFICORNIS-group.

Hardy, *Proc. Linn. Soc. N.S.W.*, lxi, 1936, 93.

This group was proposed to cover forms that come near the *peregrina*-group, standing intermediate in position between it and the *misera*-group. In this way *S. depressa* is incorporated, all members having either an inner process or a broad base to the lateral process, but never with these two characters combined.

It seems possible that wherever the inner process is present in *Parasarcophaga*, the filaments are absent, and indeed, there may be a direct connection between the two, although they arise from different positions and only share a common strongly-reflexed base. Rohdendorf's drawings show some possible connecting links, but he gives insufficient details to verify the point.

Two Australian species fall here, one with, the other without, the inner process; in fact, the latter seems to have its sheath reduced practically to an enlarged pair of strongly-tapering lateral processes and three minute prominences at the sheath tip; the lobe is partly concealed and closely adjacent to the lateral process which hides it. This is quite an aberrant form which I have been unable to ally elsewhere.

SARCOPHAGA KAPPA J. & T. Fig. 20.

? *S. praedatrix* Walker, *List Dipt. Brit. Mus.*, iv, 1849, 826; Johnston & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 128. *S. kappa* Johnston & Hardy; *ibid.*, xlviii, 1923, 124; fig. 25; Hardy, *Aust. Zool.*, viii, 1934, 50.

The lateral process consists of a strip of brown chitin with a broad whitish area on the inner side. The pair of lateral processes appears thus to be contiguous along the median line and there is no apical prominence. In Johnston and Hardy's figure this process is erroneously marked "a.p.".

Hab.—Northern Territory, Queensland and New South Wales; very abundant in northern Australia.

SARCOPHAGA DEPRESSA Desvoidy.

Johnston & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 119; fig. 20; Noble, *Agric. Gaz. N.S.W.*, xlvii, 1936, 384.

Hab.—Western Australia, South Australia, Tasmania to southern Queensland. It seems to be the most abundant species in Western Australia as fourteen males and two females are represented in the collection of Mr. K. R. Norris, who collected only twenty-three specimens from this State.

SARCOPHAGA ALBICEPS-group.

Hardy, *Aust. Zool.*, vii, 1932, 278; *ibid.*, viii, 1934, 52; Ho, *Bull. Fan. Mem. Inst. Biol.*, iii, 1932, 345-358. *Parasarcophaga* Rohdendorf, *Inst. Zool. Acad. Sci. URSS.*, (12) xix, 1937, 198, 442 (subgen.).

The wide distribution of the typical form, Europe to Java, suggests that, in literature, there is a complex standing under the name. The group is mainly Oriental and Australian in distribution, two species being in Australia.

SARCOPHAGA OMEGA J. & T.

Johnston & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 116; fig. 17, Hardy, *Aust. Zool.*, vii, 1932, 279; fig. 4; Hardy, *Proc. Roy. Soc. Qd.*, li, 1940, 145.

This, the typical form of *Parasarcophaga*, is regarded by some authors as being *S. knabi* Parker, but there is a difference in general colour and appearance, and also in the type of country they respectively inhabit. In addition Rohdendorf has given a figure for *knabi*, taken from Ho's figure, that shows differences in the forceps, anterior clasper and lobe.

Hab.—Queensland, New South Wales and South Australia. It seems to be mainly an inland species reaching the coastal districts of all three States.

SARCOPHAGA ORCHIDEA Bott.

Bottcher, *Ann. Mus. Nat. Hung.*, xi, 1913, 375; Hardy, *Proc. Roy. Soc. Qd.*, li, 1940, 145. *S. gamma* Johnston and Tiegs, 1921; Johnston and Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 125; fig. 26.

Confusion exists concerning this species in New Caledonia. Curran (*Amer. Mus. Nov.*, 375, 1929, pp. 10–11) gives 1 male and 2 females from Bourail under the name *S. gamma*, and a unique male from Noumea under the new name *S. noumea*, stating it to be "similar to *S. gamma* but at once distinguished by the male genitalia". The figure given for the latter is that of *S. orchidea*, and he fails to describe where the difference lies. I doubt not that *S. noumea* is a synonym, but whether *S. gamma* as identified by Curran is conspecific with that of Johnston & Tiegs may be open to question. In his key Curran separates the two species on the vertical bristles which occur on *noumea* Curran and *gamma* J. & T., but are said to be absent on *S. gamma* of Curran. No other distinguishing feature is given and reliance cannot be placed on these bristles. Other species recorded from the island are *S. knabi* Parker ("with slight differences") and *P. australis* J. & T.

In Johnston and Hardy's figure the lateral processes are erroneously marked as being apical processes, the mistake being due to the fact that they are contiguous.

Hab.—Queensland; very common on the coastal area, but reaches inland and also into New South Wales, where it becomes a seasonal fly. The distribution extends through the equatorial zone to India and China. There is a close ally in the Palaearctic region, *S. hirtipes* Wiedemann, which also reaches India.

SARCOPHAGA MISERA-group.

Hardy, *Proc. Linn. Soc. N.S.W.*, lii, 1927, 452; *ibid.*, lxi, 1936, 93.

Liosarcophaga (Enderlein), Rohdendorf, *Inst. Zool. Acad. Sci. URSS.*, (12) xix, 1937, 205, 442 (subgen.).

This group formed by a large element in the Palaearctic, and extending to North America, is represented by five species in Australia, one being introduced.

SARCOPHAGA MISERA Walker.

Johnston & Hardy, *Rec. Aust. Mus.*, xiv, 1923, 67; fig. 2; *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 112; fig. 13. Hardy, *ibid.*, lii, 1927, 452; figs. 2, 4 and 5; *ibid.*, lxi, 1936, 93; Rohdendorf, *Inst. Zool. Acad. Sci. URSS.*, (12) xix, 1937, 223; figs. 318–9. *S. ceylonensis* Curran, *Amer. Mus. Nov.*, 375, 1929, 10—*nec* Parker.

Rohdendorf's figure does not agree with the Australian species as it differs by not having the lateral process bifid towards the tip, and also the filaments are too long. Rohdendorf compares his species with *S. jaroschevshyi* Rohd., the figure of which is more like the present species in these two respects, and, as Rohdendorf extends the range of Walker's species to China, it would seem that the specific identity given by this author is needing confirmation.

Hab.—Queensland to Victoria and South Australia; also Lord Howe Island.

SARCOPHAGA KOHLA J. & H.

Johnston & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 113; fig. 14; Hardy, *ibid.*, lii, 1927, 453.

Hab.—Queensland and New South Wales.

SARCOPHAGA ETA J. & T.

Johnston & Hardy, *Proc. Linn. Soc. N.S.W.*, xlviii, 1923, 117; fig. 18.

Hab.—Queensland.

SARCOPHAGA AURIFRONS Macquart.

Johnston & Hardy, PROC. LINN. SOC. N.S.W., xlviii, 1923, 115; fig. 16.

Hab.—Queensland and New South Wales.

SARCOPHAGA SECURIFERA Villeneuve.*

Johnston & Hardy, PROC. LINN. SOC. N.S.W., xlviii, 1923, 114; fig. 15; Rohdendorf, *Inst. Zool. Acad. Sci. URSS.*, (12) xix, 1937, 251, 451; figs. 273, 352, 353 and 356 (subgenus *Jantia*).

In the sense here used, this species falls to the *misera*-group, but Rohdendorf erected a new subgenus for its reception.

Hab.—Widely distributed in temperate countries, this species has been introduced into New South Wales.

Subgenus SARCOPHAGA Meigen.

Hardy, PROC. LINN. SOC. N.S.W., xli, 1936, 91–3; Rohdendorf, *Inst. Zool. Acad. Sci. URSS.*, (12) xix, 1937, 280.

There are two groups allowable within the *Sarcophaga sensu stricto*, namely the *carinaria*-group, which is Palaearctic in distribution, and the *crinata*-group which is Oriental and Australian. Both are limited in numbers and are very close to each other in affinities. The name, however, still covers many species for which generic and subgeneric names are not available.

SARCOPHAGA SPINIFERA Hardy.

Hardy, *Aust. Zool.*, vii, 1932, 277; fig. 2; *ibid.*, viii, 1934, 50; Lopes, *Mem. Inst. Oswaldo Cruz*, xxxiii, 1938, 562; Pl. 3, figs. 6–8.

This species requires to be placed in another subgenus, but I have been unable to ally it with any named group. The affinities would seem to be with the South American fauna.

Hab.—Queensland: there are only two males known.

SARCOPHAGA CRINATA-group.

Hardy, *Aust. Zool.*, viii, 1934, 50–2; PROC. LINN. SOC. N.S.W., lxi, 1936, 93; *Proc. Roy. Soc. Qd.*, li, 1940, 144.

This group is limited to the Oriental and Australian regions, with three known species in Queensland, but only one of them yet described. The second species was caught on the sea-shore near Brisbane, the third was reared from a Cossid moth, *Xyleutes*, found in *Bassia quinqueuspis*, north of Mungindi. The larvae had been found on a prior occasion with the same habit, but they failed to mature. These two apparently-new species will be described when it becomes possible to isolate them effectively from those of the Orient.

The group is akin to the typical *carinaria*-group of the Palaearctic region.

SARCOPHAGA SYNIA J. & H.

Hardy & Johnston, PROC. LINN. SOC. N.S.W., xlviii, 1923, 127; fig. 28; Hardy, *Aust. Zool.*, viii, 1934, 53; PROC. LINN. SOC. N.S.W., lxi, 1936, 91–2 (in keys).

Hab.—Queensland: Brisbane and Dunk Island.

Species doubtfully Australian.

SARCOPHAGA ASSIMILIS Macquart.

Macquart, *Dipt. exot.*, suppl. 4, 1849, 234; Bergroth, *Stettin ent. Ztg.*, 1894, 74.

Macquart's species from "Oceanea" is said to be a male similar to *aurifrons*, has a golden head and is about 12 mm. long. It differs by having longer hairs on the posterior

* In R. Frey's "Die Dipterenfauna der Kanarischen Insel und ihre Problems" (*Soc. Scient. Fennica*; *Comm. Biol.*, vi, 1936, 142) occurs "*S. crassipalpis* Macq. = *securifera* Vill. sec Villeneuve". It thus seems that this change in name needs to be made, but I have seen no other reference, the present name being in general use.

tibiae. Bergroth refers to a species from Peak Downs, Queensland, under this name without description, but judging from Macquart's description, it is likely to be a *Chrysosarcophaga*. There is no reason, however, to suppose Macquart's and Bergroth's forms are conspecific.

Species to be removed from the Sarcophaginae.

SARCOPHAGA PALLICRUS Thomson.

Thomson, *Eugenies Resa*, Dipt., 1869, 539; Johnston & Hardy, PROC. LINN. SOC. N.S.W., xlviii, 1923, 128.

The name was placed by Lopes as being possibly *Helicobia australis* J. & T., and a note by Johnston and Hardy may be responsible for this idea. The latter authors, however, have definitely stated that they do not consider Thomson's species to be a Sarcophagid fly.

The original description is applicable to a species of *Calliphora*, subgenus *Onesia*, and no other genus conforms to it. I am of the opinion that it is *Calliphora minor* Malloch, a common Sydney fly, and the blue abdomen has a certain amount of whitish overlay to which the words "pube pruinosa albida minus crebre obtectus" in Thomson's description may be referring.
